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**SPECIES  
RECOVERY**



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## SANTA CRUZ: An Island Reborn

by Bob Hansen

**S**PECIES RECOVERY—a harsh phrase. It implies injury to the very things we seek to preserve. Yet it also hints at successful efforts to breathe new life into a population of plants or animals undergoing some adverse pressure. In the case of an island off California's central coast, the words "species recovery" apply in their broadest sense. For not long ago, an entire island system here would have been extirpated had steps not been taken to restore its natural balance.

Lying 24 miles from Santa Barbara, Santa Cruz Island rises out of the Pacific Ocean to a height of more than 2,400 feet and covers nearly 100 square miles. Deep canyons punctuate its two rugged mountain ranges. Numerous perennial streams and

creeks expire on gravel or sandy beaches at canyon mouths or plunge from ocean cliffs into the sea. Mixing with little concern for neighboring pelagic birds, seals and sea lions "haul out" along the rocky shoreline. Seasonal rains starting in the fall pelt the island and give rise to a viridescent grassland splashed by an array of wildflowers flaunting every hue of the rainbow. Spring brings desiccating winds that by summer parch the land until it turns a dull brown.

Season after season Santa Cruz, largest isle in the chain known collectively as the Channel Islands, provided refuge for myriad plant and animal species that originally made their way to this rugged landscape purely by chance. Carried by howling winds



or rolling seas—or as stowaways on flotsam or other vehicles—more than 600 different plant species, 200 bird species, 13 terrestrial mammals, a number of reptiles and amphibians, and countless insects arrived on Santa Cruz and thrived for millennia.

For more than 6,000 years Chumash Indians called Santa Cruz Island home. Aboard seaworthy canoes made by lashing redwood planks together and caulking the seams with tar from natural seeps, they frequently voyaged between California's central coast and the Channel Islands. Yet these island dwellers required little or nothing from the mainland to survive, even though they engaged in a sophisticated trade network with their neighbors. (They manufactured shell-bead "money" and exchanged this and other goods for stone bowls, obsidian, and antlers.)

All of the essentials the Chumash needed to survive were abundant on "Limu," their sanctuary in the sea. Century after century they gathered acorns for meal, chert for arrowheads and drills, stems for bows, bird plumage for clothing, and fruits, bulbs, and berries—plus millions of pounds of fish and shellfish—for daily sustenance. To the native Chumash, Santa Cruz Island was a complete provider; they attached little significance to any unusual varieties of life that were, to them, an everyday occurrence. But barely 100 years after the Chumash were removed to mainland missions, biologists would acknowledge Santa Cruz as a major repository of the results of evolution. All told, they eventually recorded more than three dozen endemic plant species and subspecies that occur nowhere else on Earth, except on the Channel Islands. Eight of these are found only on Santa Cruz.

Isolated from the mainland for tens of thousands of years, the rugged terrain of Santa Cruz provided the ideal natural laboratory for the development and differentiation of a host of remarkable plant species. From common ancestral stock, island trees developed leaf structures not found on mainland trees. The result? Entirely new species. Common monkey flower blossoms took on a bright red color and were described as a singular species for Santa Cruz—*Diplacus parviflorus*. On coastal bluffs and cliff faces, in wooded canyon bottoms, and on exposed sun-drenched mountainsides, botanists encountered and named entirely new plant forms: hairy manzanita (*Arctostaphylos viridissima*), Fraser Point live-forever (*Dudleya nesiotica*), and Santa Cruz Island rock cress (*Arabis hoffmannii*). The island pine also was found to be a distinct Santa Cruz form, *Pinus remorata*. In addition, relict species dotted the island. Nearly 1,000 different stands of "ironwood" (*Lyothamnus floribundus* ssp. *asplenifolius*) flourished as reminders of a species once common and widely distributed on the mainland

but now absent for some inexplicable reason. In all, ten different plant communities evolved and thrived here.

In contrast to this substantial and unusual flora, Santa Cruz Island harbored relatively few native animal species. A notable exception is a fox that took its place at the top of the food chain and—owing to lack of competition and predators—developed characteristics that would give it separate species status. The Santa Cruz Island fox (*Urocyon littoralis* ssp. *santacruzae*) is tiny, varies in color from its "cousins" on the other Channel Islands, and lacks any fear of other animals.

**A**FTER THE DEPARTURE of the Chumash Indians, Santa Cruz lay unused by western settlers. An attempt to establish a colony of convicts and outcasts on the island in the early 19th century was unsuccessful. Then, around 1850, herds of cattle and sheep were introduced; ranching began in earnest. The livestock was managed according to practices of the time. It wasn't long before "open grazing" led to wholesale unmanaged browsing by increasing numbers of sheep that had reverted to a wild state. Initially, ample water, shelter, and edible vegetation sustained the sheep population and allowed for its exponential growth. But the feral herd soon began to exceed the island's carrying capacity, or ability to produce forage. By 1870 the ranchers were attempting to curb or otherwise control the exploding sheep population.

The entire island began to suffer periodically as the sheep's populations rose and fell with each new attempt to control their numbers. Pine, oak, ironwood, and any other seedlings were immediately eaten. As the animals grazed first on trunk sprouts, then on low branches, and finally (upright on their hind legs) on the vegetation left within reach, trees acquired an uncharacteristic mushroom shape caused by the distinct five-foot-high "browse-line." Entire grasslands, including native bunchgrasses, were consumed, and thousands of acres were reduced to bits of stubble and, eventually, to bare ground.

Worse, normal soil composition and chemistry began to change in many areas. As surface temperatures rose because of the removal of all vegetative cover, greater evaporation and reduced moisture retention occurred; soil acidity also increased. The resulting alterations in the composition of plant communities often favored non-native weeds, and what was once a pristine setting began to look "wrong" or out of character. Moreover, with the total removal of low vegetation, leaf litter, and humus, winter rains began to strip the exposed soil to bedrock. Not only were the roots of trees and woody shrubs laid bare, but with each successive



*Left: Over the years, sheep on Santa Cruz Island browsed the lower branches of native cherry trees, giving the trees an uncharacteristic mushroom shape.*

*Below: Protected from the four-footed mowers by a fence, the vegetation on the left side recovered quickly while the unprotected area on the right remained denuded from overgrazing.*



storm the sea also showed plumes of mud-laced water at the mouth of each canyon. Endemic species were vanishing; an entire island biological system was breaking down.

**WHAT WOULD HAPPEN** if more than 100 years of intensive indiscriminate grazing were brought to a halt? Would seedling survival increase

dramatically along with a proliferation of native species? Or would the more hearty introduced "weedy" plants take over, thus preventing the return of the desired natives? Would scars heal quickly or take years to mend?

Hints at the answers to these questions were indicated by the results, tests, and experiments carried out on the island over many years. After





Peter Schuyler



Peter Schuyler

The same location but not the same place—sheep grazing these hillsides left only the vegetation they could not reach, leaving a bleak and desolate landscape (top). Once the sheep were removed, plants revived dramatically.

"exclosures" were erected in several locations by a number of different researchers, remarkable results were recorded. Tree bases began sprouting vigorously, and a mixture of native and non-native grasses returned to areas that before had been only sparsely covered. Ground cover generally increased on all the ungrazed restricted sites. But what would occur if whole 6,000-acre sections of the island were cleared of sheep as opposed to these plots only a few square meters in size?

Having obtained a conservation easement and eventual ownership of 90 percent of Santa Cruz in 1978, The Nature Conservancy initiated a complete study the following year of the sheep and their impact. We hoped to solve the feral sheep problem that had long plagued the island's owners and to begin restoring the native plant communities on Santa Cruz.

In 1980 groups of volunteers began repairing or replacing miles of fence in order to divide the island into a series of definable "pastures" that would confine the sheep to designated areas. Gradually, through an intensive ground-hunting program, each of these pastures was cleared of feral sheep. As the effort continued for six years, every passing season showed results.

At first, signs of recovery were vague. Island foxes hardly lined up at the gate of each sheepless pasture patiently awaiting their return to a homeland. But because grassland seedlings and annual wildflowers remained ungrazed, the young plants survived not only the winter but thrived on into spring and summer as well. Instead of making only a mottled showing, annuals burst forth everywhere, even in the middle of sheep trails and bedding grounds. As though a wild-fire had swept across the island, reducing competition among plant species and releasing nutrients, Santa Cruz returned to life. Many of the woody shrubs produced fresh, green sprouts; island oak and pine seedlings flourished. In a few places some of the more common native plants began to grow where bare ground had been the rule. Clumps of native bunchgrass appeared in place of introduced European grasses. New populations of native buckwheat, monkey flower, and bush poppy took hold.

As the fencing and hunting program continued into the most severely damaged island sections—and as each season brought its moisture and sunlight—the vegetation in these areas also started to recover dramatically. Succulents and other plants once much preferred by the feral stock began to reappear in open country. Previously confined to vertical cliff faces well out of reach of sheep, the brilliant yellow blooms of giant *Coreopsis* fairly lit the entire winter landscape. Live-forever literally seemed to "creep" back over the cliff edges and to

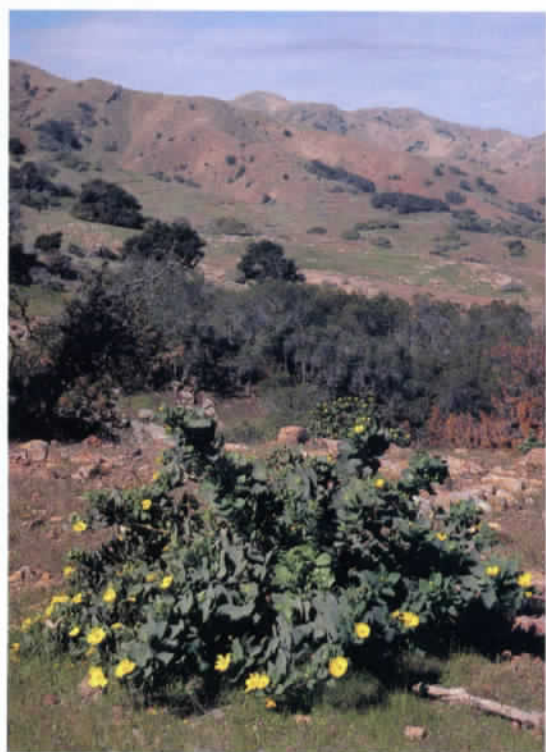




Making a comeback on Santa Cruz: Live-forever (*Dudleya greenei*), an island endemic, thrives on a steep cliff face (above). Giant coreopsis (*Coreopsis gigantea*), native to California's Channel Islands and southcentral coast, is becoming abundant once again (left). Formerly overbrowsed, a slope on the north shore now boasts young island bush poppy (*Dendromecon rigida* ssp. *harfordii*), endemic to Santa Cruz and Santa Rosa islands (below).



bask in the open sun. Deep in the ironwood and oak groves, shoots emerged around the base of long standing adult trees, and seedlings of these species took root and thrived for the first time in decades. The nutrient-rich litter of a season's growth remained on the ground, followed by another and an-



other season of accumulation. Straight-edged browse lines became jagged, and vegetation began to dip low to the ground. Hillsides laced with sheep trails lost their symmetrical lines and graded into a solid blanket of green.

**I**T'S MUCH MORE difficult to work on Santa Cruz Island these days. One hundred meter line-transect tapes become tangled in brush or suspended in arcs across clumps of grass instead of lying in neat, flat lines on bare ground. Blazing a path through thigh-high grasslands or among low branches and clinging vines is more tiring than following a well-worn sheep trail. But silver deer-

weed (*Lotus argophyllus* ssp. *niveus*), a Santa Cruz endemic once on the brink of extinction, is flourishing. And ironwood seedlings, extremely rare in previous years, are reappearing in significant numbers. Everywhere you look, the Earth's phenomenal ability to heal itself, if given a chance, is apparent. In the case of Santa Cruz Island that sometimes harsh-sounding phrase, "species recovery," should be prefaced by the word "successful."

A California native and seven-year veteran of the Conservancy, **Bob Hansen** was formerly the Santa Cruz Island project director. He is now the Conservancy's Southern California field representative.

**F**requently, the Conservancy's recovery efforts are aimed at a single species, rather than at an entire natural community. Following are some examples of what the organization hopes will become tomorrow's success stories.

Ever since its 1927 discovery in Giles County, Virginia, Peters mountain mallow (*Iliamna corei*) has been declining. This single known site, originally harboring 50 individual plants, now shelters only four—the last four remaining in the wild today. To protect the species in its natural setting, Conservancy staff and contractual researchers erected a fence around the mallows to exclude grazing deer (fans of *Iliamna*'s succulent buds) and, during a long drought, regularly hauled buckets of water to the site. Mean-



Steve Croy

while the recovery effort for *Iliamna* is focusing on collecting seeds from the wild plants and nurturing them in controlled settings at the Virginia Polytechnic Institute and State University. Experiments also are underway to determine what may have caused the natural population's dramatic decline and what constitutes the mallow's ideal environment. The Virginia Field Office staff hopes to use University-grown seedlings to replenish the wild stand and to stabilize the mallow's habitat. The ultimate goal? *Iliamna*'s natural regeneration.



Jon Farrar

Contrary though it may sound, saving a species sometimes means ignoring generally accepted conservation techniques. Blowout penstemon (*Penstemon haydeni*), a Nebraska Sandhills endemic in the final stages of being listed as a federally protected species, seems to present a protection problem in reverse. To survive, the plant appears to require an active "blowout" or depression caused by severe wind erosion of the sandhills. But modern ranching practices in this region have encouraged the growth of grass cover, which stabilizes the dunes. The improving range condition is apparently the greatest threat to the penstemon.

Approximately one-fifth to one-third of the entire penstemon population occurs on the Conservancy's Graves Ranch Preserve in western Nebraska. Here the organization is maintaining the current number of blowouts by allowing cattle to feed freely on the pastures throughout the grazing season. This inhibits the grass cover and allows erosion to occur. In addition, experimental stands of penstemon have been started on the Conservancy's Niobrara Valley Preserve to test several hypotheses about the plant's habitat requirements and appropriate management strategies for the species.